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DOES REGULATION MODERATE OPERATIONS
COST AND OPERATIONAL PERFORMANCE
RELATIONSHIP AMONGST THIRD PARTY PORT-
CENTRIC LOGISTICS FIRMS IN KENYA?

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Abstract

This research paper explored the moderated relationship between operations cost management and operational performance of third-party port-centric logistics (3PL) firms in Kenya by looking at the concept from its original proponents in Toyota Production system to the current applications in services. The study tested the conceptual model of the relationship between the two variables and was guided by the specific objective which was to determine the regulated relationship between cost as a lean practice and operational performance of third-party port-centric logistic firms in Kenya. Port-centric logistics services providers are highly regulated firms and therefore it was critical to find out the effect the regulatory framework has on the operational performance of these firms. The relationship between lean cost and operational performance has been tested in numerous contexts as well as other studies. A survey design based on stratified sampling with a disproportionate approach consisting of 164 firms (15% of the population) was used in data collection data. This comprised of 164 firms which were served with questionnaires targeting the sampled 164 third-party port-centric logistics firms. Response rate for this study was 75.6% (124 firms). Data analysis was carried out using moderated multiple regression (MMR) analysis where relationship between the variables was computed. Test of internal consistency, validity test, reliability and normality test, were conducted, all indicating appropriateness of data. The strength of the regression model was found to be 53.6% (adjusted R²) which was considered good enough, appreciating the fact that operational performance is also affected by other factors outside the model. The null hypothesis (H₀) was tested and the results indicated that there was statistically significant evidence that operations cost management greatly influenced operational performance. Moderation results pointed to a strong statistically significant [F (1, 119) = 71.474, p = 0.000] moderation effect of regulation on the relationship between operations cost management and operational performance of third-party port-centric logistics firms in Kenya with R² change of 1.71 at p=0.000. The findings immensely provide information and knowledge that will play a critical role in research agenda in the area of lean and operational performance,

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particularly in service management. This study provides critical information, knowledge, foundation and an elevation from where a research agenda and policy discussions can be referenced. The study recommends policy formulation that will support measures to boost operations and administrative cost amongst 3PL firms' continuous growth in terms of the firms' fundamentals and of micro and macro-economics. This will help in creating 3PL firms that are efficient, effective and with superior operational performance, first to the benefit of the customers (importers and exporters), and to the entire national economy and eastern Africa at large. The study recommends that 3PL firms, although negatively affected by regulatory framework, take it upon themselves to devise smart cost interventions that will lead to efficiency operation strategies that will enable them compete and emerge victorious in operational performance and excel in the competitive battle.

Keywords: Lean, Cost Management, Regulation, Third party logistics service providers, Operational performance

1. INTRODUCTION

Ohno (1988) at the Toyota Motor Company developed the lean strategy in 1950s. It is a business model that focuses on systematic identification and elimination of waste from a process and involves changing and improving processes (Motwani, 2003) while delivering quality products to the manufacturer and consumer at the lowest cost. Krafcik (1998) describes lean as an approach to a manufacturing that uses less of everything; half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time. Lean also requires keeping far less than half the needed inventory on site, results in many fewer defects, and produces a greater and ever growing variety of products (Papadopoulou & Özbayrak, 2005). This study was anchored on two theoretical foundations; Resource Based View (RBV) theory whose proponents argue that superior firm performance is the ability of firms to accumulate resources and capabilities that are rare, valuable and

difficult to imitate (Barney, 2000). Customer Value Theory maintains a firm view that a market-oriented organization always applies her resources and competencies to create superior innovative value propositions for its customers. A study on Cost or differentiation strategy unfolded improved financial performance of 3PL providers in China and in underdeveloped 3PL industries revealed these firms maintained a reasonable service performance (Wang, Huo, Fujun, & Chu, 2010).

2. LITERATURE REVIEW

Regulation of business activity is a key issue confronting national governments and supranational policymakers [Organisation for Economic Co-operation and Development (OECD), 2000]. It is a diverse set of instruments by which governments set requirements on enterprises and citizens and comprises a set of 'incentives' established either by the legislature, Government, or public administration that mandates or prohibits actions of citizens and enterprises. Most of the times, regulations are supported by the explicit threat of punishment for non-

compliance [Organisation for Economic Co-operation and Development (OECD), 2000; 1994]. They are government measures or interventions that seek to change the behaviour of individuals or groups [Better Regulation Task Force (BRTF), 2003].

Operations cost management focuses on the ability to effectively manage production cost, including its related aspects such as overhead and inventory and value-addition. When a firm's operations department chooses lowering cost as its competitive priority, it must strive to produce at lowest cost and offer products at the lowest market price (Huo, Selen, Yeung & Zhao, 2008). Many manufacturers do not solely or even primarily compete on the basis of cost as a competitive priority, although cost is such an important competitive device (Browning & Heath (2009). Actually, the application of traditional or classical management approaches (financial measures of cost of service/production, rigid bureaucratic structures and tight worker control) have been increasingly challenged and shown to be ineffective with new business models emphasizing the importance of holistic, systems or process perspectives (Blanchard, 2007).

In cost leadership, a firm sets out to become the low cost producer in its industry for a given level of quality. In this arrangement, the firm sells its products either at average industry prices to earn a profit higher than that of rivals, or below the average industry prices to gain market share (Thompson, Strickland & Gamble, 2010). In the event of a price war, the firm can maintain some profitability while the competitor suffers losses. If a firm can achieve and sustain overall cost leadership, then it will be an above average performer

in its industry, provided it can command prices at or near the industry average (Huo et al., 2008).

When a firm's operations department chooses lowering cost through efficient low cost operations as a competitive priority, it must strive to produce at lowest cost and offer products at the lowest market price (Huo et al., 2008). There are a number of studies that show firms enroute this direction end up with higher productivity (Oyerogba, Olaleye & Solomon, 2014; Wee & Simon, 2009; Piercy & Rich, 2009; Blanchard, 2007). However this is not always the case, for instance a study on lean supply on the design and cost reduction dimensions indicated of existence of barriers in the effort to meet lean benefits such as lower prices amongst partners (Wang et al, 2010; Blanchard, 2007; McIvor, 2001).

Most notable was the rise of the lean enterprise as an organisational formation that represented a step-change in operational design from previous scientific approaches. This approach focuses on bottom-up, worker-led improvements and a process wide approach to production that has drastically reduced costs and improved quality across a range of industries and an observation done that lean transformation has made inroads into a range of manufacturing arrangement and that the concept is still being developed and its application the service sector still at the up-scale stages (Piercy & Rich, 2009). This study hypothesized that there is no significant difference in the moderated relationship between cost management and operational performance of third-party port-centric logistics firms in Kenya. The conceptual thinking of the study as presented below.

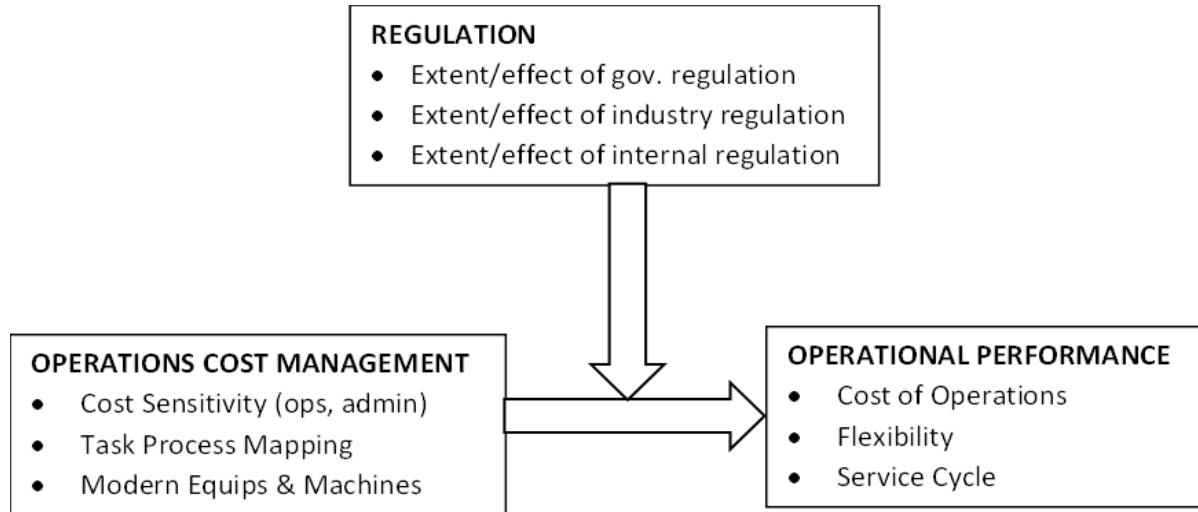


Figure 1 Conceptualization of the Study

3. METHODOLOGY

The research design for this study was a survey design with a cross sectional approach. The study was largely quantitative. A survey design enables identification of characteristics of a particular group to measure attitudes and describe behavioral patterns (Zikmund, Babin, Carr & Griffin, 2012). In order to realize the study objective, positivism research paradigm was used which involves objective testing of empirical hypothesis that are formulated on the predictions of objected phenomena allowing operationalisation of the hypothesis and generalization of the results (Ketchen, Rebarick, Hult & Meyer, 2008).

The population of this study was 1064 registered third-party port-centric logistics firms in Kenya (KRA, 2016). The sampling frame was a listing of the firms as provided by Kenya Revenue Authority (KRA), the body with the legal mandate to license third party port-centric logistics firms in Kenya. The choice of a sample size was largely informed by a scholarly viewpoint by Saunders, Lewis and Thornhill (2009) and Mugenda (2008). The study used a representative sample size of 164 third party port-centric logistics firms in Kenya representing about 15% of the population (1064 firms). Table 1 indicates sample size determination.

Table 1 Sample Size Determination

Stratum (Location of 3PL Firms)	Pop. Proportion (3PL Firms)	3PL Firms in the Sample	% Proportion	Stratum
Nairobi (Capital)	566	84	14.8%	
Mombasa (Seaport)	491	73	14.9%	
Nakuru	2	2	100%	
Eldoret	3	3	100%	
Kisumu	2	2	100%	
Total	1064	164		

4. ANALYSIS OF THE STUDY VARIABLES

A total of 164 questionnaires were administered, out of which 124 questionnaires were filled and returned. This represented a response rate of 75.6%. Operations cost management was divided into three sub-constructs, cost sensitivity initiatives, investment in modern equipment and machines and task-process mapping. In order to measure reliability of data collection instruments, internal consistency technique using Cronbach's alpha was used in this study. Reliability and correlations of data was done on the pilot data to ensure the instruments were

good to go before data collection and after data collection to confirm that the instruments remained as good with the actual field data. The overall test of reliability for all the variables produced Cronbach's Alpha value of 0.764 based on standardized values. This was slightly above the excellent threshold value of 0.75 ($\alpha \geq 0.75$). This finding meant that the variables are reliable enough and that the data collected and analysed for this study produced results that can be relied on and good enough for replication and generalization.

Table 2 Study Cronbach's Alpha Test Results

Cronbach's Alpha	Cronbach's Alpha - Standardized Items	N of Items	N
.947	.949	5	124

On the correlations of paired variables in the final data analysis, the generated results indicated that the variables had positive correlations and strong correlations (>0.5).

Test of Normality

Normality test ascertain whether the data variables have a normal distribution (Paul & Zhang, 2010). Some of the common ways to test normality via box plot, Q-Q Plot, and Skewness and Kurtosis which were all used in normality testing. Kurtosis

is an indicator of a degree flattening of a distribution while Skewness is as a sign of asymmetry and deviation from a normal distribution. Skewness and kurtosis values that range from +/-3 (SE) are generally considered normal (Onwuegbuzie & Daniel, 2002). Table 3 indicates that the skewness values were within the range of +/-3 for all factors. We conclude that the data followed a normal distribution.

Kurtosis and skewness was employed to test normality by Rocha, Farazi, Khouri and Pearce (2011) in their study on the status of bank lending to SMEs in the Middle East and North Africa which validated the data that was used as largely within the confines of normal distribution.

Table 3 Normality Test Using Skewness and Kurtosis

Variables	N	Std. Dev	Skewness	Kurtosis
CostMgt	124	.47680	-1.619	9.176
Regulation	124	.58876	1.754	4.302
OpsPerf	123	.38980	.463	.449

Test of assumptions of the Study

Chi-Square Test of Independence was used in this study to compare categorical variables. It was used to assess associations between categorical variables, although it provides no inferences about causation. The null hypothesis (H_0) and alternative hypothesis (H_1) of the Chi-Square Test of Independence/association was expressed as follows:

H_0 : Variable Xi (independent) is independent of variable Y (dependent)

H_1 : Variable Xi (independent) is not independent of variable Y (dependent)

Evidence of Heteroscedasticity is confirmed when the value of Prob > the

computed value of the Chi-square is less than 0.05 (Park, 2008). Table 4.13 shows that the constant variance (Chi2 values) were statistically significant with probability values $p < 0.05$. Since all the Chi-square values, 4692.621 and 5541.492 are greater than the corresponding probability values (.000 and .000), the null hypothesis was rejected and concluded that there was a statistically significant association between all the independent variables (quality management, cost management, customer orientation, operations cost management and regulation) and operational performance of third party port-centric logistics firms in Kenya.

Table 4 Heteroscedasticity Test Results

	Value of Pearson Chi-Square	df	Asymp. Sig. (2-sided)
CostMgt*OpsPerf	4692.621	3266	.000
(CostMgt*Reg)Comb*OpsPerf	5541.492	5198	.000

VIF values captures the variance of variable coefficients and how they are increased because of collinearity and a VIF value greater than five implies presence of multicollinearity, further indicating the inappropriateness of the variables (Cohen, Cohen, West & Aiken 2013). Tolerance measures the impact of collinearity among the variables in a regression model and is

computes using the expression $(1 - R^2)$. The VIF value for operations cost management had a value of 1.504 and that for regulation was 1.088, concluding that the presence of multicollinearity amongst the two variables largely lacks evidence. Chang, Liao, Yu, and Ni (2010) tested multicollinearity using the VIF and tolerance approach.

Table 5 Multicollinearity Test

Variables	VIF (1/1-R ²)	Tolerance (1-R ²)
CostMgt	1.504	.665
Regulation	1.088	.919

In order to test sampling adequacy or suitability of data used in the study, Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity were used. KMO value gives index which explains the degree of variances in the study variables that emanates from the underlying factors. KMO value approaching 1 (≤ 1) implies that factor analysis would work for the data, a good indicator that the factors used in the study are good enough (Pallant, study.

2010). For Bartlett's Test of Sphericity tests is an indicator of whether variables used in the study related/unrelated posing suitability of structure detection. The results of this test for this study indicates a strong result of sampling adequacy where KMO value is 0.741, a value close to 1. The Bartlett's Test of Sphericity Test, with $p < 0.05$ is an indication of suitability of data for structure detection. These tests therefore confirm that the data set used in this are suitable for the analyses in this

Table 6 KMO and Bartlett's Test

KMO Test of Sampling Adequacy	Bartlett's Test of Sphericity
.741	Approx. Chi-Square 253.324 df. 10 Sig. 0.000

4 Operations Cost Management and Regulation on Operational Performance

In order to realize the objective of this study which was to determine whether regulation moderates the relationship between operations cost and operational performance of Third Party Port-Centric Logistics Firms in Kenya, a regression analysis was carried out using the model:

$$Y = \beta_0 + \beta_1(\text{CostMgt}) + \beta_2(\text{CostMgt*Reg}) + \xi_2 \quad \text{----- Equation (1)}$$

Where Y is the dependent variable representing the operational performance of third- party port-centric logistics firms in Kenya in the model, β_{01} is a constant factor which is also the value of the dependent variable before the independent variable X_i assumes any value, such as when $X_1 = 0$, β_1 and β_2 are the regression coefficients associated with operations cost management (X_1) and the product of costmgt and moderation (regulation) variable. ξ is the stochastic or random disturbance term which addresses the

random error or all other minor inconsequential effects on the model and which have not been captured. Using the data that was collected for this study, moderated regression analysis was conducted and a regression matrix was obtained as shown in table 7.

5 Moderation Effect of Regulation on the Relationship between Operations Cost Management and Operational Performance

Table 7 shows that for Model 1, $R = .737$, $R^2 = .544$ and $[F(2, 120) = 71.503, p = .000]$. The value of R^2 indicates that 54.4% of the variance in the third party port-centric logistics firms' operational performance was explained by operations cost management scores and regulation. Model 2 shows the results after the interaction term (Cost Management*Regulation) was included in the model. It indicates that the inclusion of this interaction term resulted into an R^2 change of 0.171, $[F(1, 119) = 71.474, p = 0.000]$.

Table 7 Moderated Multiple Regression Model Summary for Cost Management

Model	R	R ²	Adj R ²	SEE	Change Statistics				
					R ² Change	F Change	df1	df2	Sig. F Change
1	.737 ^a	.544	.536	.26548	.544	71.503	2	120	.000
2	.846 ^b	.715	.708	.21072	.171	71.474	1	119	.000

a. Predictors: (Constant), Cost Management, Regulation

b. Predictors: (Constant), Cost Management, Regulation, CM*REG

Table 8 displays the results of Model 1 and shows that operations cost management was statistically significant ($p = 0.000$; Beta value = .159); Regulation was also

statistically significant ($p = 0.000$). This implies that for a 1-unit increase in cost management, operational performance of 3PL firms was predicted to increase by .159, by holding regulation constant. The

regression coefficient associated with regulation in Model 1 implies that the difference in firm performance between third-party port-centric logistics firms with high regulation and those with low

regulation is 0.737, given that operations cost management is held constant. Using these regression coefficients the mathematical model represented by Equation (19) was generated.

$$\text{Operational Performance} = 0.516 + 159(\text{Cost Management}) + 0.737(\text{Regulation}) \quad \text{-----}$$

----- Equation (2)

The results show a presence of statistically significant ($p=0.000<0.05$) moderating effect of regulation on the relationship between operations cost management and operational performance. To put it differently, the moderating effect of Regulation explains 17.1% variance in the operational performance, above and beyond the variance by operations cost management and Regulation.

model. Operations cost management was found to be statistically insignificant ($p=0.512$, Beta value = .024). Regulation was found to be significant ($p=0.000$, Beta value = 0.673). On introduction of interaction term, CM*Regulation was found to be statistically significant at $p=0.000$ with a Beta value of 0.164. With the introduction of the moderation term, new regression coefficients were generated and a mathematical regression model generated as represented by Equation (20).

Model 2 in Table 8 reveals the details of the inclusion of the interaction term in the

$$\text{Operational Performance} = -0.28 + 0.024(\text{Cost Management}) + 0.673(\text{Regulation}) + 0.164(\text{CM*Regulation}) \quad \text{-----}$$

----- Equation (3)

The result in Table 8 for Model 2 indicate that for a 1-point increase in the Cost Management, the Operational Performance is predicted to increase by 0.024, given that regulation was held constant. The interpretation of the regression coefficients for the interaction term is that there was a 0.164 difference between the slope of operational performance and operations cost management between third-party port-

centric logistics firms with low regulation and those with high regulation. Results based on equation above led to the conclusion that there was a statistically significant moderating effect of regulation on the relationship operations cost management and operational performance of third party port-centric logistics firms in Kenya

Table 4.43 Moderated Multiple Regression Model Coefficients for Cost Management

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.516	.232		2.225	.028
	CM	.159	.041	.241	3.910	.000
	REG	.737	.066	.692	11.218	.000
2	(Constant)	-.028	.195		-.141	.888
	CM	.024	.036	.036	.658	.512
	REG	.673	.053	.632	12.775	.000
	CM*REG	.164	.019	.466	8.454	.000

a. Dependent Variable: Operational Performance

6 STUDY SUMMARY AND CONCLUSION

This study reconnoitered and anchored on both theoretical and empirical studies on lean practices from which the conceptual model was developed. Further, the hypothesized relationships based on the relationship of independent and dependent variables were tested and conclusions made thereof. In order to conduct successful empirical test, several assumptions of the study variables were tested and which were positive thereby supporting the credibility, applicability and generalizability of this study. The study found out that there was a significant moderated relationship between operations cost management and operational performance of third party port-centric logistics firms in Kenya. The findings of this study revealed that there was a significant difference in operational performance of third-party port-centric logistics firms with high regulation and third-party port-centric logistics firms with

low regulation. Therefore, hypothesis that there is no significant effect of regulation as a moderating variable on the relationship between lean cost and operational performance of third-party port-centric logistic firms in Kenya was rejected.

When 3PL firms' effort are towards dealing with service efficacy in services, the end result is achievement of better and less costly operations performance. It is no doubt that regulation is necessary to provide stable trading conditions and to help generate a level of business trust and therefore a good thing in an organized business environment (World Bank, 2002; Atherton et al., 2008). The rise of the lean enterprise has led to the improvements and a process wide approach to production that has drastically reduced costs and improved quality of goods and services across board (Womack & Jones, 2003). Indeed, in china where all industries are closely and tightly regulated, third-party logistics providers in mainland China maintained a reasonable service performance (Wang et al, 2010).

7 CONCLUSIONS OF THE STUDY

The study was generally successful and the goal achieved. The findings immensely provide information and knowledge that will play a critical role in research agenda in the area of lean and operational performance, particularly in service management. The study found out that the relationship between operations cost management and operational performance was statistically significant. The findings also indicate that regulation is a good thing in the relationship in moderating the relationship between operations cost management and operational performance of third party port-centric logistics firms in Kenya. Practically it is important to note that these firms operate largely in a regulated environment by statutory bodies such as Kenya Revenue Authority (KRA), Kenya Ports Authority (KPA) and member bodies such as KIFWA and KTA amongst others and as such as there must be compliance whether it inhibits individual firm performance or otherwise. For instance, transit cargo cannot be moved from a bonded storage warehouse facility without physical verification and authorization by a customs office. This may affect the logistics flexibility and speed and affect, for instance, the number of turnarounds in cargo movement, with an impact on the earnings, but firms must still comply. The study recommends policy formulation that will support measures to boost operations and administrative cost amongst 3PL firms continuous growth in terms of the firms' fundamentals and of micro and macro-economics. This will help in creating 3PL firms that are efficient, effective and with superior operational performance, first to the benefit of the customers (importers and exporters), and to the entire national economy and eastern Africa at large. The study recommends that 3PL firms, although negatively affected by regulatory framework, take it upon themselves to device smart cost

interventions that will lead to efficiency operation strategies that will enable them compete and emerge victorious in operational performance and excel in the competitive battle.

8 RECOMMENDATIONS

The study proposes policy formulation that supports measures that boost and reinforces (without inhibiting) performance in 3PL firms. Consequently, this study provides critical information, knowledge, foundation and an elevation from where a research agenda and policy discussions can be referenced. The study recommends policy formulation that will support measures to boost and 3PL firms continuous growth in terms of fundamentals and quality services for the interest of both micro and macro-economics. This will help in creating 3PL firms that are efficient, effective and with superior operational performance, first to benefit of the customers (importers and exporters), and secondly, the entire national economy and eastern Africa at large. The core of the lean success in 3PL is the eventual supply chain success. This study proposes that all stakeholders in the entire supply chain work together in a coordinated manner in order to reinforce supply chain effectiveness in order to continuously step up operational performance and organizational fundamentals into future. Since third party logistics providers business is largely dependent on other critical players such as regulators, port operators, providers of financial services, amongst others, this study recommends an industry wide study be conducted by bringing in more variables to test the relations and effects on operational performance by logistics services providers

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